Amendments to the Claims

Please amend the pending claims as follows:

1. (currently amended) An apparatus ~~Apparatus~~ for monitoring in real time the movement of a plurality of substances in a mixture, the apparatus comprising:

an X-ray scanner, wherein said X-ray scanner performs ~~arranged to make~~ a plurality of scans of the mixture over a monitoring period to produce a plurality of scan data sets;[[,]] and

control means arranged to analyze ~~analyse~~ the data sets to identify volumes of each of the substances and to measure their movement.

2. (currently amended) The apparatus ~~Apparatus~~ according to claim 1 wherein the apparatus produces ~~arranged, on each scan, to produce~~ a data set relating to a layer of the mixture.

3. (currently amended) The apparatus ~~Apparatus~~ according to claim 2 defining ~~arranged to define~~ a plurality of volume elements in said layer and using ~~to use~~ a measure of the X-ray attenuation in each of said volume elements to form the data set.

4. (currently amended) The apparatus ~~Apparatus~~ according to claim 2 ~~or claim 3~~ wherein the control means uses ~~is arranged to use~~ the data sets to determine the amount of at least one of the substances in said layer.

5. (currently amended) The apparatus ~~Apparatus~~ according to claim 4 wherein the control means uses ~~is arranged to use~~ the data sets from each of the scans to determine a time averaged value of the amount of said at least one substance.

6. (currently amended) The apparatus ~~Apparatus~~ according to claim 2 ~~any of claims 2 to 5~~ wherein the scanner is arranged to produce data sets relating to a plurality of layers of the mixture, wherein the layers are ~~being in~~ different positions from each other.

7. (currently amended) The apparatus ~~Apparatus~~ according to claim 6 wherein the control means is arranged to use the data sets relating to said plurality of layers to measure movement of at least one of the substances.

8. (currently amended) The apparatus ~~Apparatus~~ according to claim 7 wherein the control means is arranged to track the movement of regions of said substance through the plurality of layers to determine a flow velocity of said substance.

9. (currently amended) The apparatus ~~Apparatus~~ according to claim 1 ~~any foregoing claim~~ wherein the control means is used ~~arranged~~ to measure the movement of a region of a first ~~one of the~~ substance~~s~~, to determine a measure of the buoyancy of said region relative to at least one other substance, and to measure the movement of said at least one other substance using the movement of said region and said buoyancy.

10. (currently amended) The apparatus ~~Apparatus~~ according to claim 1 ~~any foregoing claim~~ wherein the control means ~~is arranged to define a model for calculating~~ defines a model used to calculate a parameter of movement of the substances on the basis of a number of variables, to produce a measured value of the parameter from the scan data sets, and to determine at least one of said variables from the measured value and the model.

11. (currently amended) The apparatus ~~Apparatus~~ according to claim 1 ~~any foregoing claim~~ wherein the control means is used ~~arranged~~ to determine a flow rate of at least one of the substances, the flow rate being defined as the amount of said substance flowing through a predetermined region in a predetermined time.

12. (currently amended) The apparatus ~~Apparatus~~ according to claim 1 ~~any foregoing claim~~ wherein the control means is used to analyze ~~arranged to analyse~~ a scan data set in two stages, wherein one stage provides ~~providing~~ a relatively lower spatial resolution and higher contrast resolution ~~than the other~~.

13. (currently amended) The apparatus ~~Apparatus~~ according to claim 12 wherein the control means uses ~~is arranged to use~~ the higher spatial resolution analysis to identify volumes of a first of said substances and uses ~~to use~~ the higher contrast resolution analysis to distinguish between volumes of two further substances.

14. (currently amended) The apparatus ~~Apparatus~~ according to claim 13 wherein the control means uses ~~is arranged to use~~ the high spatial resolution analysis to adjust a measure of X-ray attenuation[[,]] of volume elements defined in the low spatial resolution analysis, to account for the presence in said volume elements of the first substance.

15. (currently amended) The apparatus ~~Apparatus~~ according to claim 1 ~~any foregoing claim~~ wherein the scanner is ~~arranged to be~~ placed around a pipe to measure the movement of the substances through the pipe.

16. (currently amended) The apparatus ~~Apparatus~~ according to claim 1 ~~any foregoing claim~~ further comprising display means for displaying ~~arranged to display~~ an image of the mixture controlled by the control means.

17. (currently amended) The apparatus ~~Apparatus~~ according to claim 16 wherein the display means ~~is arranged to~~ displays a video image of the mixture.

18. (currently amended) A method of monitoring in real time the movement of a plurality of substances in a mixture, the method comprising:

performing ~~making~~ a plurality of X-ray scans of the mixture over a monitoring period to produce a plurality of scan data sets;[[,]] and

analyzing ~~analysing~~ the data sets to identify volumes of each of the substances and to measure their movement.

19. (currently amended) A method according to claim 18 wherein~~,~~ ~~on~~ each scan[[,]] produces a data set ~~is produced~~ relating to a layer of the mixture.

20. (currently amended) A method according to claim 19 further comprising defining a plurality of volume elements in said layer and using a measure of the X-ray attenuation in each of said volume elements to form the data set.

21. (currently amended) A method according to ~~claim 19 or~~ claim 20 wherein the data sets are used to determine the amount of at least one substance ~~of the substances~~ in said layer of the mixture.

22. (currently amended) A method according to claim 21 wherein the data sets from each of the scans are used to determine a time averaged value of the amount of said at least one substance.

23. (currently amended) A method according to claim 19 ~~any of claims 19 to 22~~ wherein data sets are produced relating to a plurality of layers of the mixture, wherein the layers are in ~~being in~~ different positions from each other.

24. (original) A method according to claim 23 wherein the data sets relating to said plurality of layers are used to measure movement of at least one of the substances.

25. (original) A method according to claim 24 wherein the movement of regions of said substance through the plurality of layers is tracked to determine a flow velocity of said substance.

26. (currently amended) A method according to claim 18 ~~any of claims 18 to 25~~ wherein movement of a region of a first ~~one of the substances~~ substance is measured, a measure of the buoyancy of said region relative to at least one other substance is determined, and the movement of said at least one other substance is measured using the movement of said region and said buoyancy.

27. (currently amended) A method according to claim 18 ~~any of claims 18 to 26~~ wherein a model is defined for calculating a parameter of movement of the substances on the basis of a number of variables, a measured value of the parameter is produced from the scan data sets, and at least one of said variables is determined from the measured value and the model.

28. (currently amended) A method according claim 18 ~~to any of claims 18 to 27~~ wherein a flow rate of at least one of the plurality of substances is determined, the flow rate being defined as the amount of said substance flowing through a predetermined region in a predetermined time.

29. (currently amended) A method according to claim 18 ~~any of claims 18 to 28~~ wherein a scan data set is analyzed ~~analysed~~ in two stages, wherein one stage provides ~~providing~~ a relatively lower spatial resolution and higher contrast resolution ~~than the other~~.

30. (original) A method according to claim 29 wherein the higher spatial resolution analysis is used to identify volumes of a first of said substances and the higher contrast analysis is used to distinguish between volumes of two further substances.

31. A method according to claim 30 wherein the high spatial resolution analysis is used to adjust a measure of X-ray attenuation[[,]] of volume elements defined in the low spatial

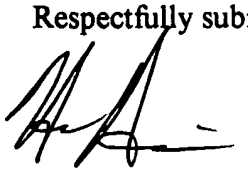
resolution analysis, to account for the presence in said volume elements of the first substance.

32. (currently amended) A method according to claim 18 ~~any of claims 18 to 31 carried out using a~~ wherein the scanner is placed around a pipe to measure the movement of the substances through the pipe.

33. (cancelled)

34. (cancelled)

Respectfully submitted,



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